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Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

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(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
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Supercharger arrangements for engine assemblies

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SUPERCHARGER ARRANGEMENTS FOR ENGINE ASSEMBLIES

The present invention relates to supercharger arrangements for engine assemblies and in particular to a supercharger arrangement for an engine equipped with a plurality of superchargers.

It is known to provide an engine with one or more superchargers, which may be embodied in the form of exhaust driven turbo-chargers. Superchargers usually require a lubrication system and many such lubrication systems are closed circuits often using engine oil as a lubricant. The lubrication system usually includes an oil feed conduit and an oil return conduit. The oil feed supplies oil under pressure from an oil pump of the engine to the or each supercharger concerned and the oil return comprises a conduit adapted to drain the oil away towards a collection area such as an oil sump of the engine. Life expectancy of a turbo-charger relies considerably on a steady flow of clean oil supplied to its bearings under pressure from the engine's lubrication system and on the free exit of that oil for its return back to the engine sump.

In US-4716735, an exhaust gas driven turbo-charger arrangement is proposed in which an engine mounting is integrated with a bearing housing of the turbo-charger. Oil supply and return passages are defined through the mounting for use in lubrication of the turbo-charger bearings. Such an arrangement requires a custom-made turbo-charger in order to integrate its bearing housing with the engine mounting of a particular installation. Custom-made turbo-chargers may prove more expensive than using mass-produced items.

The arrangement proposed in US-4716735 is best suited to use in engine assemblies having only one turbo-charger and may not prove suitable for use in an arrangement calling for a plurality of turbo-chargers. For example, in a multi-cylinder engine having its cylinders arranged in banks in a 'V' or 'W' configuration, it may be desirable to provide a plurality of turbo-chargers.

Taking the example of a 'V' configured engine and attempting to fit a plurality of turbo-chargers according to US-4716735 dedicated one to each bank, it will be found that a symmetrical set-up is not possible. In order to bolt a second example of the same component to the opposite side of the engine block, the whole turbo-charger and integrated mounting assembly of that

second example must be rotated 180°. One problem with such an arrangement is that the compressor and exhaust turbines of the opposing turbo-chargers will point towards opposite ends of the engine. This may lead to complex and less than ideal inlet and exhaust ducting. To reverse the orientation of the turbo-charger would require an inverted casting for the bearing housing, resulting in a customised turbo-charger on each side of the engine. Rather than reducing piece cost by doubling volume, such an arrangement might prove cost prohibitive as it would significantly increase the investment necessary in producing both right- and left-handed parts. In addition, it would necessitate precautions in parts delivery to the side of the production line, e.g. to ensure smooth delivery of the right parts to the assembly stations affected in equal volumes of each and to their appropriate sides of the line.

It is an object of the present invention to provide improved supercharger arrangements for engine assemblies and in particular to provide an improved arrangement for an engine equipped with a plurality of superchargers.

Accordingly, the present invention provides a supercharger arrangement for an engine assembly, the arrangement including first and second superchargers that are mounted on said engine assembly by means of first and second mounting members respectively, each said mounting member having an integrated supercharger lubrication conduit, characterised in that said superchargers are of substantially identical construction and are separable from said first and second mounting members and in that said integrated lubrication conduits are routed through their respective said mounting members in such a manner as to enable said first and second superchargers to be mounted on said engine assembly in substantially mirror image orientations thereabout.

Among the advantages of the present invention is the provision of a low cost arrangement for using a plurality of substantially identical superchargers on the same engine while achieving substantially mirror image orientations of those units around the engine. This saves costs by raising the volumes of an expensive part of a supercharging arrangement, the supercharger itself, rather than necessitating several different and possibly custom units.

Said mounting members may be disposed in use on substantially opposing sides of a portion of said engine assembly. These sides may for example comprise opposite sides of a cylinder crankcase of said engine

assembly.

Said lubrication conduits may each comprise a lubricant feed passage and a lubricant return passage and the disposition of at least part of said feed and return passages may be substantially inverted between said mounting members. Inversion of said feed and return passages may take operative effect at supercharger mounting faces of said mounting members. Said mountings may comprise separable components from said superchargers and the rest of said engine assembly and may be connectable to said engine by an engine mounting face and to a said supercharger via a supercharger mounting face, said lubricant feed and return passages being crossed-over in one said mounting member between its engine mounting face and its supercharger mounting face.

When said superchargers are mounted on said engine, at least one of corresponding pairs of charge air entries, charge air exits, exhaust gas entries or exhaust gas exits of said superchargers may be disposed at substantially the same orientation as each other with respect to a portion of said engine assembly.

At least one said mounting member may comprise a casting or a moulding and may be preferably a component that is separable from both its associated said supercharger and from the rest of said engine assembly.

At least one said supercharger may comprise a variable geometry supercharger and preferably an exhaust gas driven turbo-charger.

The present invention also provides an engine assembly including first and second superchargers mounted thereto on first and second supercharger mounting members respectively, each said mounting member having integrated therewith a lubrication feed passage and a lubrication return passage, characterised in that said superchargers are separable from their associated said mounting members and the disposition of said feed and return passages is substantially inverted between said mounting members in the region of respective supercharger mounting faces thereof in such a manner that said superchargers are mountable interchangeably between said first and second mounting members with substantially mirror image orientations and preferably regardless of which said supercharger is mounted to which said mounting member.

Said engine assembly may comprise a multi-bank engine having a cylinder crankcase and a plurality of cylinders that are connected to said crankcase and are disposed in banks at an angle with respect to each other, said first and second mounting members preferably being disposed on substantially opposite sides of a portion of said engine assembly and said first and second superchargers preferably being associated with different said banks of said engine assembly.

The present invention also provides a set of supercharger mounting members suitable for use in a supercharger arrangement or engine assembly according to the present invention, each said supercharger mounting member having integrated therewith a supercharger lubrication feed passage and a supercharger lubrication return passage and end portions of said feed and return passages being substantially inverted between a pair of said mounting members in the region of supercharger mounting faces thereof, whereby said mounting members are preferably mountable to substantially opposing sides of a said engine assembly so that in use substantially identical superchargers are mountable one each to said mounting faces and are disposed in substantially mirror image orientations about said engine assembly.

The present invention also provides a method of mounting a plurality of superchargers on an engine assembly, the engine assembly preferably comprising a multi-bank engine having a crankcase and a plurality of cylinders that are connected to said crankcase and are disposed in banks at an angle with respect to each other, the method including ;

a) providing on substantially opposing portions of said engine assembly first and second supercharger mountings, each of which mountings has integrated therewith a lubrication feed passage and a lubrication return passage whose disposition is substantially inverted between at least a portion of said mountings ; and

b) connecting first and second substantially identical superchargers to said first and second mountings respectively in substantially mirror image orientations about said engine assembly.

The present invention will now be described by way of example only and with reference to the accompanying drawings, in which:

Figure 1 is a schematic diagram of an engine assembly incorporating an arrangement according to the present invention:

Figure 2 is a schematic representation of a section through an engine assembly incorporating an embodiment of the arrangement of Figure 1;

Figure 3 is a close-up view of a first portion of Figure 2;

Figure 4 is a close-up view of a second portion of Figure 2;

Figure 5 is a perspective front view of a component of a practical embodiment of the arrangement of Figures 1 to 4;

Figure 6 is a perspective rear view of the component of Figure 5;

Figure 7 is a perspective front view of a further component of a practical embodiment of the arrangement of Figures 1 to 4;

Figure 8 is a perspective rear view of the component of Figure 7;

Figure 9 is a plan view of the disposition of the components of Figures 5 to 8 in an installed position, shown with respect to a possible but non-limiting installation in which the front of the engine assembly is marked "F";

Figure 10 is an end view of the arrangement of Figure 9, viewed from one end (e.g. a front end "F") of the engine assembly;

Figure 11 is the plan view of Figure 9 having a supercharger mounted onto each of the components of Figures 5 to 8;

Figure 12 is the view of Figure 10 having a supercharger mounted onto each of the components of Figures 5 to 8,

Figure 13 is the view of Figure 12 seen from the opposite end (e.g. a rear end "R") of the engine assembly; and

Figure 14 is a bottom view of the arrangement of Figures 11 to 13.

Referring to the drawings, a supercharger arrangement is disclosed for an engine assembly 10. The engine 10 includes a cylinder crankcase 12, preferably in the form of a multi-bank engine block in which a plurality of cylinders (e.g. four, six, eight, ten or twelve) are connected to the crankcase 12 and are disposed in banks at an angle with respect to each other (e.g. a "V"). For the sake of example, the engine 10 of this embodiment may be considered as a V-6 engine fitted in use into an engine bay defined in a front portion of a vehicle and the engine 10 being disposed transverse to a centreline of the vehicle.

For convenience and in keeping with an exemplary transverse installation of a V-engine, the opposing banks of the engine 10 will be referred to as its front bank 14 and its rear bank 16. The banks of cylinders 14, 16 of the engine 10 are associated with respective front and rear cylinder heads 18, 20. It will be appreciated, however, that the present invention is not limited to only transverse installations and may be suitable for embodiment in the form of longitudinal, middle or rear mounted installations or in installations other than vehicles (e.g. generators or marine use).

The engine 10 is provided with a plurality of superchargers in the form of exhaust-gas driven variable geometry turbo-chargers 22A, 22B, each of which is assembled in association with an actuator 24 and are associated one each with the front bank 14 and the rear bank 16. In a variable geometry turbo-charger, a valve is provided in the turbo-charger casing. The valve is controlled by the actuator 24 and is used to vary the attack angle of exhaust gases driving the exhaust turbine so as to control its speed. For example, at low engine speeds the exhaust gas can provide only a low driving force to the exhaust turbine. The valve is then moved towards a closed position so as to increase the gas speed and thereby keep exhaust turbine speed up, even for low gas flows. On the other hand, at high engine speeds the valve is moved towards an open position so as to keep down the driving force. Such turbo-chargers may, therefore, be controlled to operate within a tight speed range. The present invention is not limited to only variable geometry turbo-chargers 22A, 22B and these may be replaceable by other types or equivalents such as waste-gate actuated turbo-chargers.

The turbo-chargers 22A, 22B are of substantially identical construction and each comprises an exhaust turbine portion 26 and a compressor turbine portion 28. The exhaust turbine portion 26 includes an exhaust gas entry 30, an exhaust gas turbine and an exhaust gas exit 32 and the compressor portion 28 includes a charge air entry 34, a charge air compressor and a charge air exit 36. The exhaust turbine and compressor turbine are drivingly joined by means of a turbine shaft 38 that is supported on a turbine bearing arrangement 40. The turbine bearing arrangement 40 is lubricated by a lubricant, e.g. in the form of engine oil that is supplied under pressure by an engine oil pump and then drained back to a lubricant reservoir such as an engine sump.

The turbo-chargers 22A, 22B are mounted to the engine 10 one on each side of the crankcase 12 by means of a pair of mounting members protruding outwardly from substantially opposing sides of the crankcase 12, referred to for convenience as the turbo-charger front mounting 46 and rear mounting 48. One or more of the front and rear turbo-charger mountings 46, 48 may be integrated with the crankcase 12, but for ease of manufacture of the mountings 46, 48 it may be found preferable to produce them as components separate from the crankcase 12 as well as from the turbo-chargers 22A, 22B and mountable to the crankcase 12, which is the form illustrated in the present embodiment.

Each turbo-charger 22A, 22B communicates with exhaust ports of at least its directly associated cylinder head 18, 20 via a connection 42 between its exhaust gas entry 30 and an exhaust arrangement 44 that includes one or more of header pipes and an exhaust manifold.

In the present embodiment, the turbo-charger mountings 46, 48 each comprise a one-piece casting or moulding having a back plate 50A, 50B and a support arm 52A, 52B extending away from the back plate. As illustrated with particular reference for the moment to Figures 5 to 10, one or both of the back plates 50A, 50B may be essentially triangular and planar in form and may be canted to one side, i.e. towards one end of the crankcase 12. In the arrangement of the present embodiment, the back plates 50A, 50B each have a base portion 54 with a mounting hole 56 defined therethrough at each end and a raised peak 58 defining an upper mounting hole 56. For substantial symmetry or mirror image, in use the raised peaks 58 are canted towards the same end of the engine assembly 10 while the support arms 52A, 52B each extend outwardly from a position substantially centralised with respect to the base mounting holes 56.

The mountings 46, 48 each have an integral lubrication conduit in the form of a lubricant feed passage 62A, 62B and a lubricant return passage 64A, 64B. The lubricant feed 62A, 62B and return 64A, 64B passages may be in the form of ducting defined through the support arms 52A, 52B and the back plates 50A, 50B, e.g. formed in the casting/moulding process. These lubricant passages 62A, 62B, 64A, 64B are adapted to connect respective front and rear lubricant supply 68A, 68B and return 70A, 70B ports of the crankcase 12 to turbo-chargers 22A, 22B mounted in use on turbo-charger mounting faces 72A,

72B, e.g. via mechanical fixings such as bolts screwed through a turbocharger-mounting flange and into mounting holes 60 defined in predetermined positions on the mounting faces. The positioning of the mounting holes 60 positions the turbo-chargers 22A, 22B in a predetermined orientation about the engine 10, e.g. along, towards or away from the cylinder crankcase 12.

It will be noted that the lubricant return passages 64A, 64B and crankcase return ports 70A, 70B are of a larger cross-sectional area that the lubricant feed ports 68A, 68B and lubricant feed passages 62A, 62B. This is because in the present embodiment the lubricant is supplied in the form of engine oil under pressure from an engine oil pump and under such circumstances the lubricant return passages 64A, 64B and crankcase return ports 70A, 70B are preferably be wider to accommodate gas bubbles in the spent oil returning to the engine sump.

In use, the lubricant feed and return passages 62A, 62B, 64A, 64B interface with lubricant inlets 74 and lubricant outlets 76 of the turbo-chargers 22A, 22B at the mounting faces 72A, 72B of the support arms 52A, 52B. The lubricant feed and return passages 62A, 62B, 64A, 64B are routed through their respective turbo-charger mountings 46, 48 in such a manner as to enable the turbo-chargers 22A, 22B to be mounted on the engine 10 via the super-charger mounting holes 60 in substantially mirror image orientations thereabout.

In such a mirror image disposition, the turbo-chargers 22A, 22B can be mounted with at least one of their corresponding pairs of charge air entries 34, charge air exits 36, exhaust gas entries 30 or exhaust gas exits 32 being disposed at substantially the same orientation with respect to the engine 10. For example, the charge air entries 34 and exhaust gas exits 32 of the turbo-chargers 22A, 22B of each cylinder bank 14, 16 may be aligned substantially parallel with a centreline C/L running longitudinally through the cylinder crankcase 12. Such a situation is illustrated in the present embodiment and may be found useful in design of an associated air intake system or exhaust piping. Similar considerations may be applied to the charge-air exits 36 and/or the exhaust gas entries 30.

The lubricant supply ports 68A, 68B and return ports 70A, 70B may be positioned symmetrically on opposing sides of the cylinder crankcase 12. This means that if identical supercharger mountings were to be used on either side

of the cylinder crankcase 12, the turbo-chargers 22A, 22B would point in opposite directions between opposing side of the engine 10. In order to compensate for this and to allow the use of substantially identical turbo-chargers 22A, 22B oriented in mirror image, e.g. pointing in substantially the same direction, the lubricant feed passages 62A, 62B and lubricant return passages 64A, 64B are operatively inverted between the mountings 46, 48.

The inversion preferably takes place in a cross-over region 66 of one mounting, shown by way of example as inside the rear bank mounting 48 and visible schematically with particular reference to Figures 1 to 4. Crankcase symmetry may be maintained between its lubricant supply and return ports 68A, 68B, 70A, 70B as illustrated schematically in Figure 2, but this may not prove practical for mass production. What is necessary, however, is for substantial inversion of the lubricant feed and return passages 62A, 62B, 64A, 64B to take operative effect at the turbo-charger mounting faces 72A, 72B. For example, in the embodiment illustrated the lubricant return passage 64A of the front mounting 46 is inboard of its associated lubricant feed passage 62A. The lubricant return passage 64B of the rear mounting 48 is therefore outboard of its associated lubricant feed passage 62B such that inversion has taken place.

While the inversion has be described in relation to implementation inside the rear mounting 48, the invention is not limited to this embodiment. The disposition of the lubricant feed and return passages 62A, 62B, 64A, 64B will usually depend on the disposition of the lubricant inlets 74 and outlets 76 of the turbo-chargers 22A, 22B, whose disposition on the mountings 46, 48 will depend in turn on which direction about the engine 10 the turbo-chargers 22A, 22B need to face and the positioning of their mounting holes 60.

To achieve the inversion through practical mountings 46, 48, it may be found easier to implement an off-set relationship between the lubricant feed and return passages 62B, 64B at their interface with the cylinder crankcase 12. An example may be seen with particular reference to the views of Figures 6 and 8. In the rear face 80 (i.e. crankcase interface side) of the front mounting 46, the lubricant feed and return passages 62A, 64A are side-by-side with the mounting 46 in its in-use position. In the rear face 82 of the rear mounting 46, the lubricant feed passage 62B is offset upwards from the lubricant return passage 64B. This arrangement may ease manufacture of the mounting 48 that

includes the internal crossover between the lubricant feed and return passages 62B, 64B, e.g. by keeping down the number of drilling operations used. For either mounting 46, 48, so as to reach its destination on the turbo-charger mounting face 72A, 72B, the lubricant feed passage 62A, 62B may pass through one or more portions of their associated mounting 46, 48 that also acts as a fillet 78.

The inversion will now be considered for the moment with particular reference to the schematic diagram of Figure 1. Symmetry across opposing sides of the cylinder crankcase 12 is preferably maintained for the lubricant supply passages 68A, 68b and return passages 70A, 70B, inversion 66 being effected through one of the mountings 48 so that feed and return passages 62A, 62B, 64A, 64B at the interface 72A, 72B, 60 between the mountings 46, 48 and the turbo-chargers 22A, 22B are functionally swapped over between sides of the engine 10 in accordance with the inversion arrows 66A. The arrangement therefore facilitates a method of mounting a pair of substantially identical turbo-chargers 22A, 22B to opposite sides of an engine 10 in mirror orientation, e.g. so that an axis through equal parts of each of those turbo-chargers 22A, 22B is disposed at substantially the same orientation as each other about the rest of the engine 10.

Referring for the moment in particular to Figures 2 to 4, it can be seen that use of identical turbo-chargers 22A, 22B in substantially mirror image orientations about the engine 10 may offset certain parts of the turbo-chargers 22A, 22B towards or away from the engine. For example, in Figures 2 to 4 it can be seen that the exhaust gas entry 30 of the front bank turbo-charger 22A is offset away from the engine 10, whereas the exhaust gas entry 30 of the rear bank turbo-charger 22B is offset towards the engine 10. This situation may effect the design of the exhaust arrangement 44 supplying the turbo-chargers 22A, 22B, e.g. with respect to primary tract length or routing.

In addition, packaging concerns may make it necessary to position one of the turbo-chargers 22A at a different spacing from the cylinder crankcase 12 than the other 22B. Such a situation is illustrated by way of example and the front bank turbo-charger 22A is spaced away from the cylinder crankcase 12 by more than the rear bank turbo-charger 22B. Although the spacing away from the cylinder crankcase 12 is different, the turbo-chargers 22A, 22B are still

orientated in substantially mirror fashion about the engine 10, with both their charge air entries 34 and exhaust gas exits 32 oriented in substantially the same way, e.g. with respect to a centreline C/L running through the cylinder crankcase 12 the turbine shaft 38 of each turbo-charger 22A, 22B runs substantially parallel to that centreline C/L with corresponding parts 32, 34 pointing in the same direction front F or rear R of the engine 10.

The spacing, alignment and inclination of the turbo-chargers 22A, 22B with respect to the cylinder crankcase 12 is defined by the dimensions, angles and turbo-charger fixing points 60 of the arms 52A, 52B. By way of example, the arm 52A of the front mounting 46 extends further out from its back plate 50A than does the arm 52B of the rear mounting 48 from its back plate 50B. This positions the front bank turbo-charger 22A further away from the cylinder crankcase 12 than is positioned the rear bank turbo-charger 22B by its mounting 48. The dimensions of fillets 78 and/or other strengthening features may vary between mountings 46, 48, e.g. in dependence on their individual packaging or load requirements.

Referring for the moment in particular to Figures 12 and 13, it can be seen that in the illustrated embodiment the corresponding charge air exits 36 and exhaust gas entries 30 do not necessarily line up with each other. This may be the case even though their corresponding charge air entries 34 and exhaust gas exits 32 are in substantially even orientation with respect to the cylinder crankcase 12. Whether or not more than one pair or set of corresponding orifices 30, 32, 34, 36 between the turbo-chargers 22A, 22B will be aligned once they are in a practical installation, may depend on the particular model of turbo-charger used.

Among the advantages of the invention is the provision of a low cost arrangement for using a plurality of substantially identical turbo chargers on the same engine while achieving substantially mirror image orientations of those units around the engine. This saves costs by raising the volumes of the expensive part of a turbo-charging arrangement, the turbo-charger itself, rather than necessitating several different and possibly custom units. The piece price of custom mountings being, of course, much lower than that of custom turbo-chargers. Furthermore, the arrangement may provide greater supplier choice as standard or off-the-shelf units may be employed. The arrangement also helps

achieve optimum packaging and design for inlet and exhaust systems by aligning two or more entries or exits of the turbo-chargers in substantially the same direction. Changes in design between variants of an engine family or installation may also be accommodated by design changes to only the mountings, whose tooling and development costs are not high.

Claims

1) A supercharger arrangement for an engine assembly (10), the arrangement including first and second superchargers (22A, 22B) that are mounted on said engine assembly by means of first and second mounting members (46, 48) respectively, each said mounting member having an integrated supercharger lubrication conduit (62A, 62B, 64A, 64B), characterised in that said superchargers (22A, 22B) are of substantially identical construction and are separable from said first and second mounting members (46, 48) and in that said integrated lubrication conduits (62A, 62B, 64A, 64B) are routed through their respective said mounting members in such a manner as to enable said first and second superchargers to be mounted on said engine assembly 10 in substantially mirror image orientations thereabout.

2) An arrangement according to claim 1, wherein said mounting members (46, 48) are disposed in use on substantially opposing sides of a portion of said engine assembly (10).

3) An arrangement according to claim 1 or claim 2, wherein said lubrication conduits each comprise a lubricant feed passage (62A, 62B) and a lubricant return passage (64A, 64B) and the disposition of at least part of said feed and return passages is substantially inverted between said mounting members (46, 48).

4) An arrangement according to claim 3, wherein inversion of said feed and return passages (62A, 62B, 64A, 64B) takes operative effect at supercharger mounting faces (72A, 72B) of said mounting members (46, 48).

5) An arrangement according to any preceding claim, wherein, when said superchargers (22A, 22B) are mounted on said engine assembly (10), at least one of corresponding pairs of charge air entries (34), charge air exits (36), exhaust gas entries (30) or exhaust gas exits (32) of said

superchargers (22A, 22B) are disposed at substantially the same orientation as each other with respect to said engine assembly (10).

6) An arrangement according to any preceding claim, wherein at least one said mounting member (46, 48) comprises a casting or a moulding and is preferably a component that is separable from both its associated said supercharger (22A, 22B) and from the rest of said engine assembly (10).

7) An engine assembly (10) including first and second superchargers (22A, 22B) mounted thereto on first and second supercharger mounting members (46, 48) respectively, each said mounting member having integrated therewith a lubrication feed passage (62A, 62B,) and a lubrication return passage (64A, 64B), characterised in that said superchargers (22A, 22B) are separable from their associated said mounting members (46, 48) and the disposition of said feed and return passages (62A, 62B, 64A, 64B) is substantially inverted between said mounting members (46, 48) in the region of respective supercharger mounting faces (72A, 72B) thereof in such a manner that said superchargers are mountable interchangeably between said first and second mounting members with substantially mirror image orientations and preferably regardless of which said supercharger is mounted to which said mounting member.

8) An engine assembly according to claim 7 or an arrangement according to any one of claims 1 to 6, wherein said engine assembly (10) comprises a multi-bank engine having a cylinder crankcase (12) and a plurality of cylinders that are connected to said crankcase and are disposed in banks at an angle with respect to each other, said first and second mounting members (46, 48) preferably being disposed on substantially opposite sides of a portion of said engine assembly (10) and said first and second superchargers (22A, 22B) preferably being associated with different said banks of said engine assembly (10).

9) A set of supercharger mounting members (46, 48) suitable for use in a supercharger arrangement or engine assembly according to any preceding claim, each said supercharger mounting member (46, 48) having integrated therewith a supercharger lubrication feed passage (62A, 62B) and a supercharger lubrication return passage (64A, 64B) and end portions of said feed and return passages being substantially inverted between a pair of mounting members in the region of supercharger mounting faces (72A, 72B) thereof, whereby said mounting members (46, 48) are preferably mountable to substantially opposing sides of a said engine assembly (10) so that in use substantially identical superchargers (22A, 22B) are mountable one each to said mounting faces and are disposed in substantially mirror image orientations about said engine assembly.

10) A method of mounting a plurality of superchargers (22A, 22B) on an engine assembly (10), the engine assembly preferably comprising a multi-bank engine having a cylinder crankcase (12) and a plurality of cylinders that are connected to said cylinder crankcase and are disposed in banks at an angle with respect to each other, the method including ;

a) providing on substantially opposing portions of said engine assembly (10) first and second supercharger mountings (46, 48), each of which mountings has integrated therewith a lubrication feed passage (62A, 62B) and a lubrication return passage (64A, 64B) whose disposition is substantially inverted between at least a portion of said mountings ; and

b) connecting first and second substantially identical superchargers (22A, 22B) to said first and second mountings (46, 48) respectively in substantially mirror image orientations about said engine assembly (10).

ABSTRACT (FIG. 2)

SUPERCHARGER ARRANGEMENTS FOR ENGINE ASSEMBLIES

A supercharger arrangement for an engine assembly 10 is disclosed, the arrangement including first and second superchargers 22A, 22B that are mounted on the engine assembly by means of first and second mounting members 46, 48 respectively. Each mounting member has an integrated supercharger lubrication conduit 62A, 62B, 64A, 64B and the present invention is characterised in that the superchargers 22A, 22B are of substantially identical construction and are separable from the first and second mounting members 46, 48. The integrated lubrication conduits 62A, 62B, 64A, 64B are routed through their respective said mounting members in such a manner as to enable the first and second superchargers to be mounted on the engine assembly 10 in substantially mirror image orientations thereabout

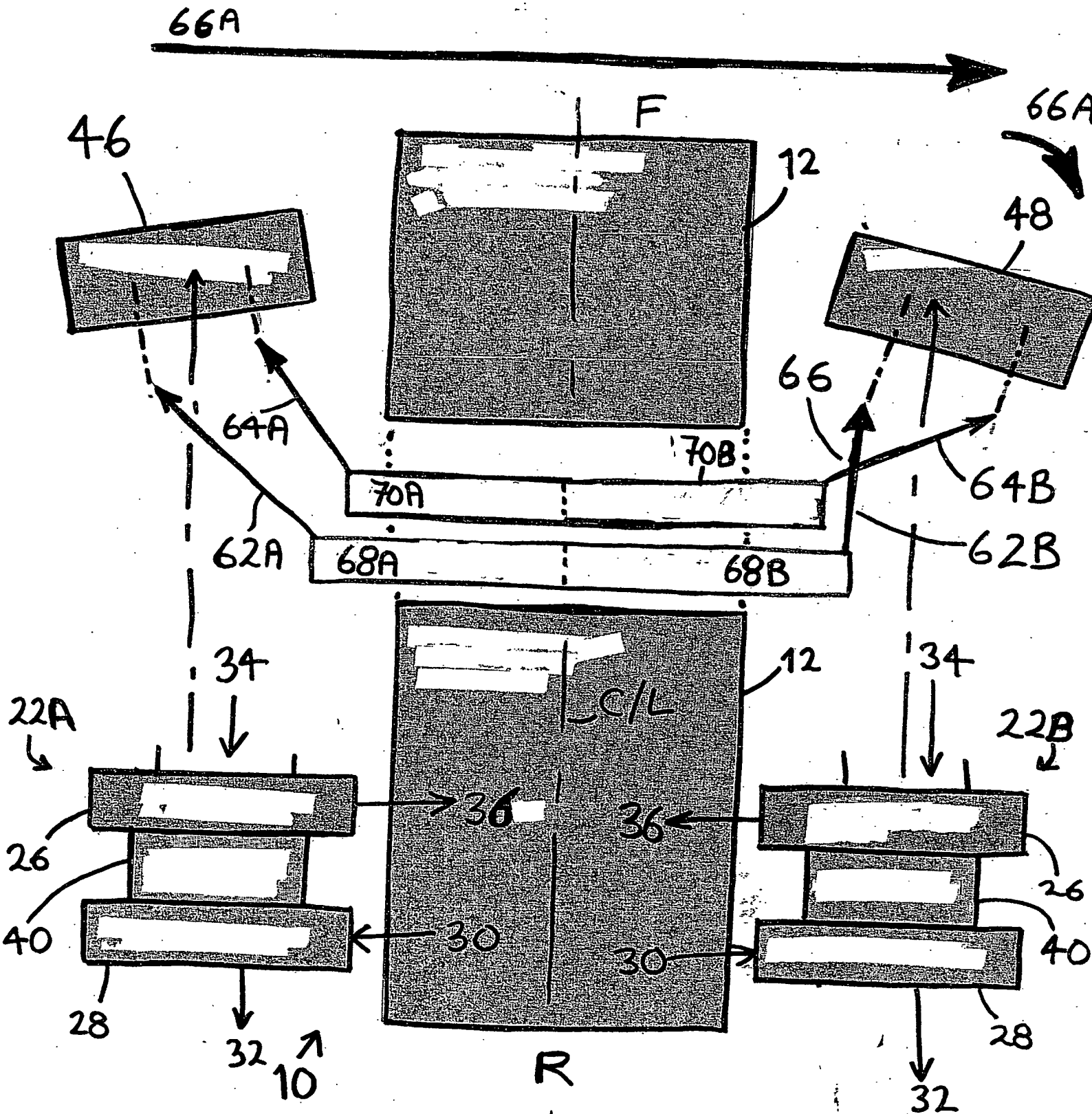
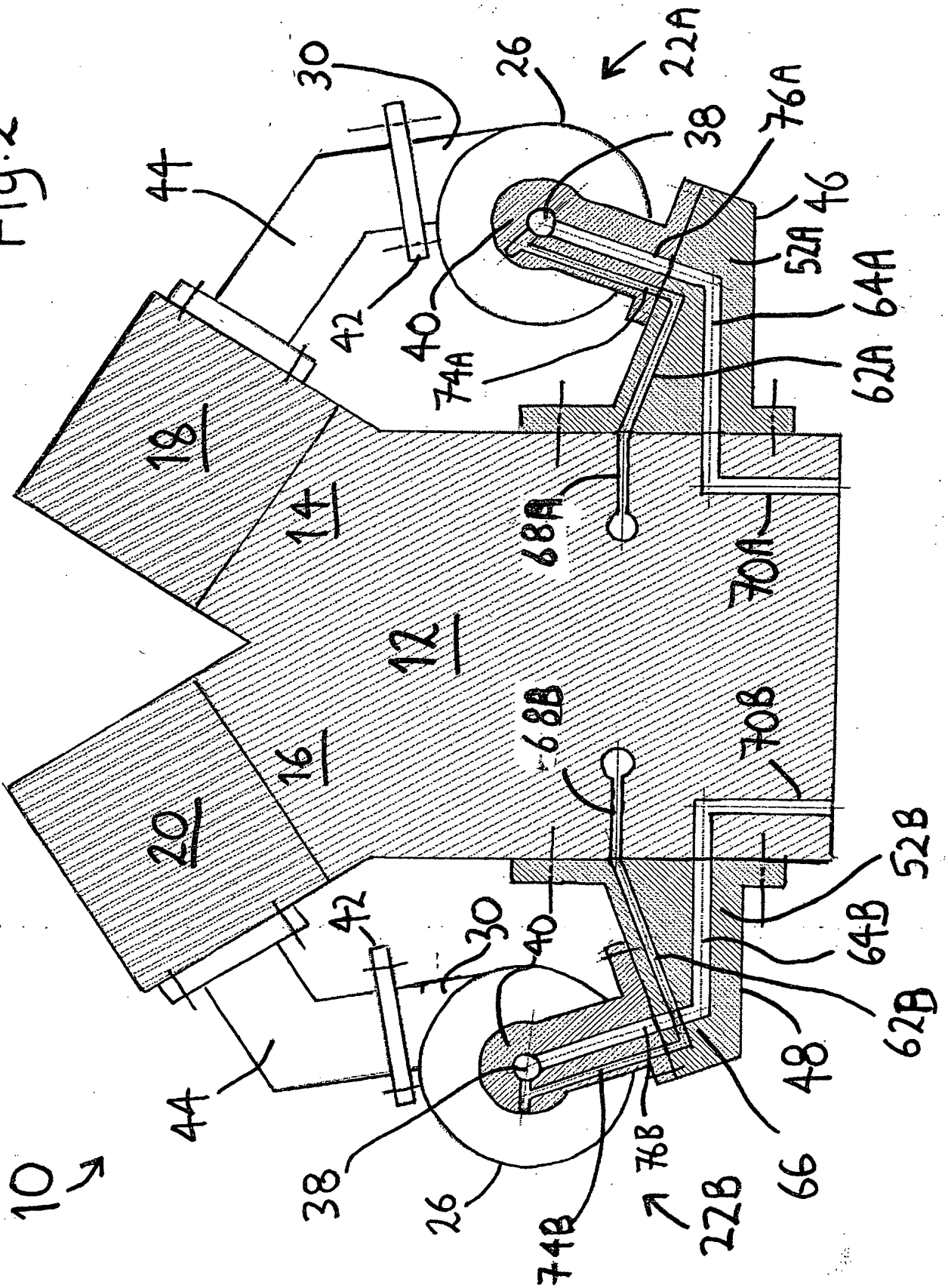

66A
F
66A
46
12
48
64A
66
70B
64B
70A
62A
68A
68B
62B
34
12
34
22A
C/L
22B
36
36
26
26
40
30
30
40
28
28
32
32
10
R

Fig.1

Fig.2


10
12
14
16
18
20
22A
22B
26
30
38
40
42
44
46
48
52A
52B
62A
62B
64A
64B
66
68A
68B
70A
70B
74A
74B
76A
76B

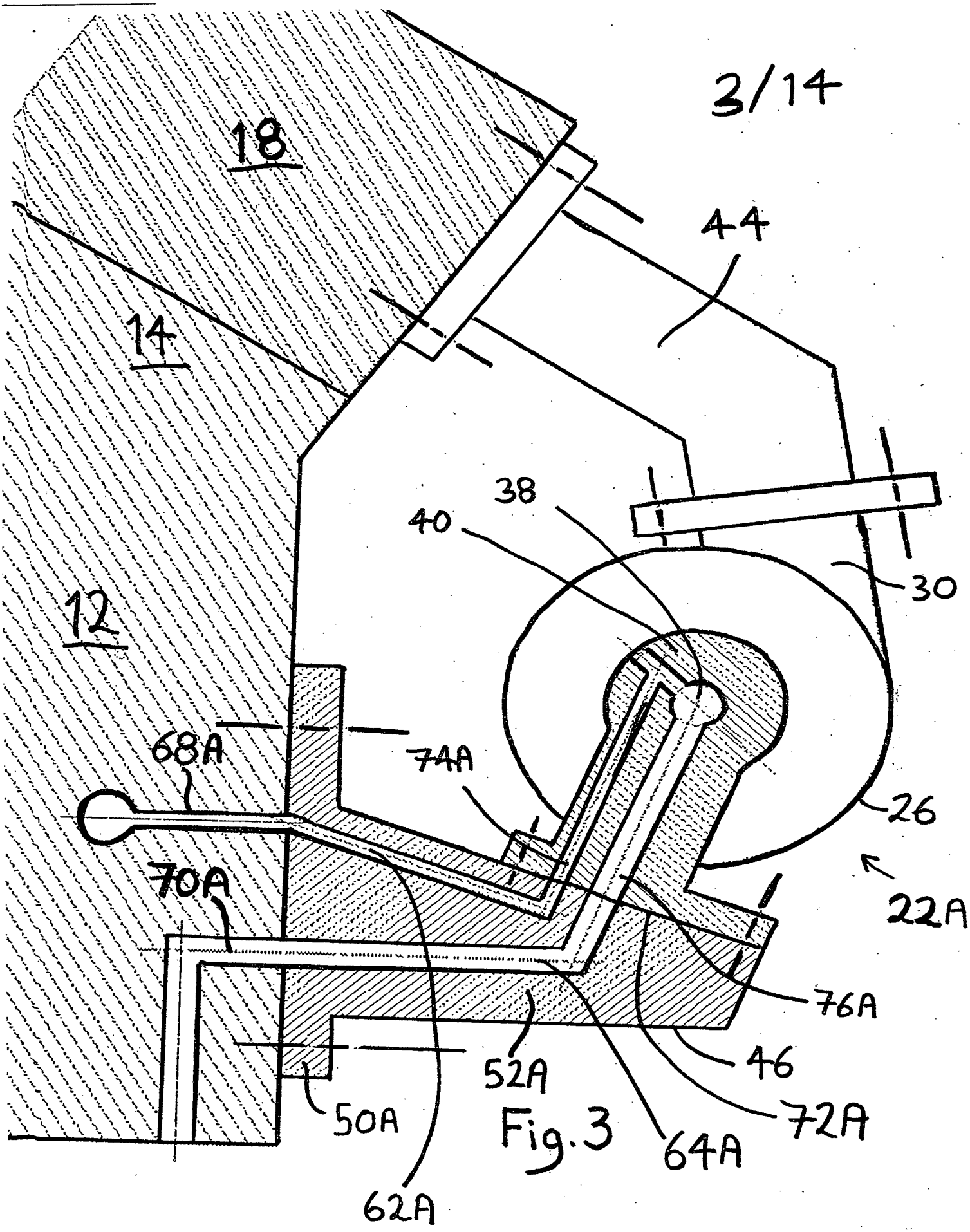
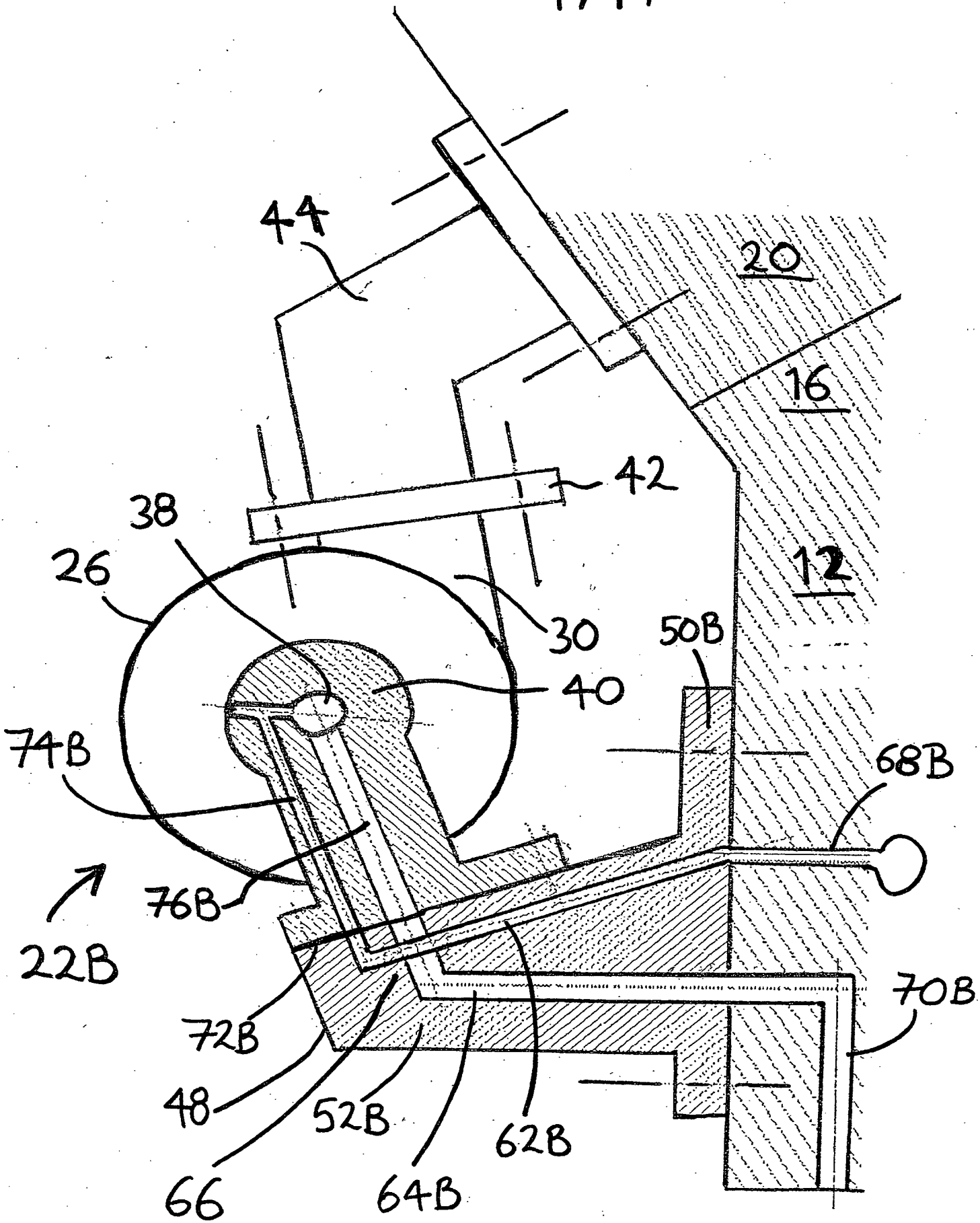


Fig. 3


44
20
16
42
38
26
12
30
50B
40
74B
68B
76B
22B
70B
72B
48
52B
62B
66
64B

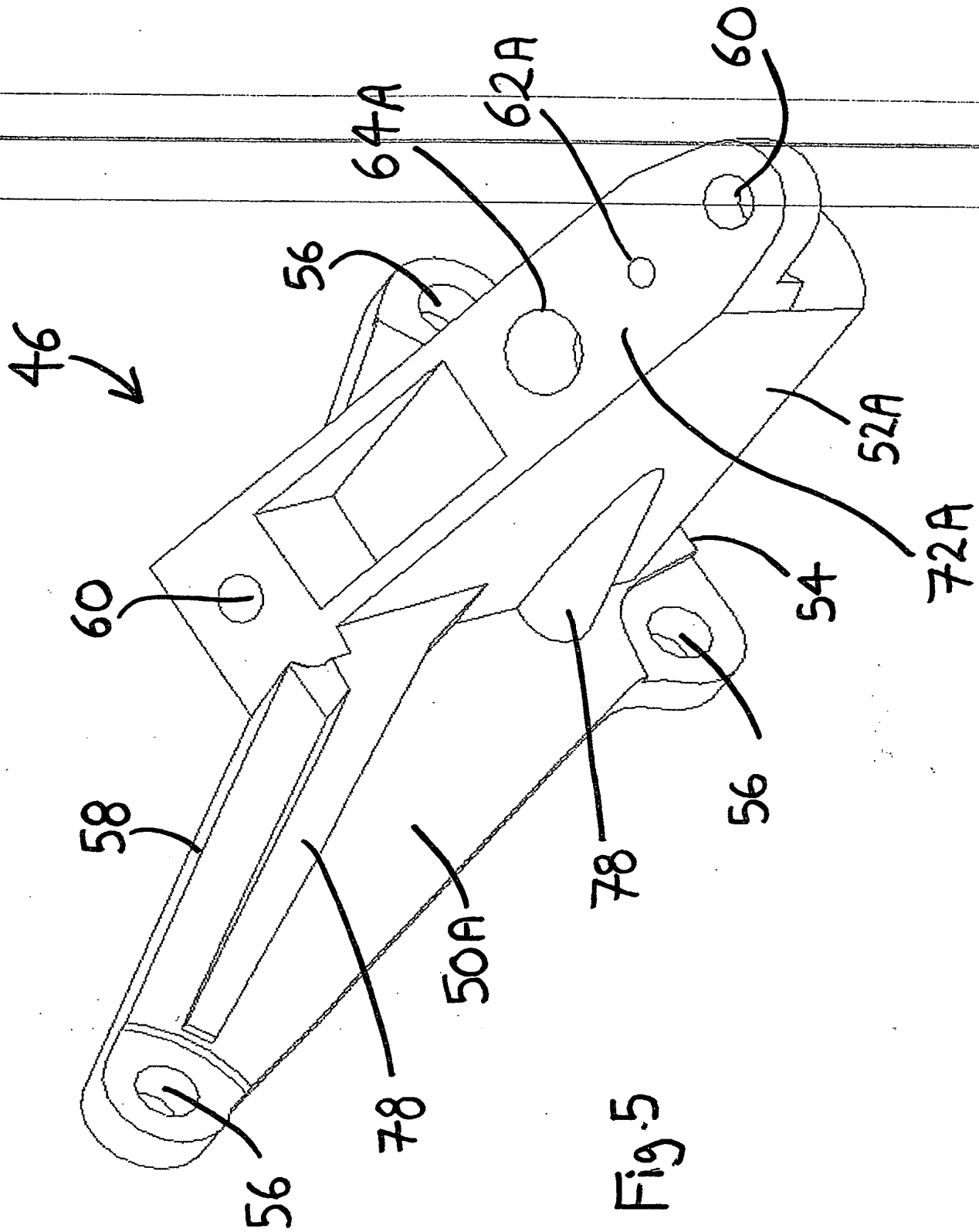


Fig.5

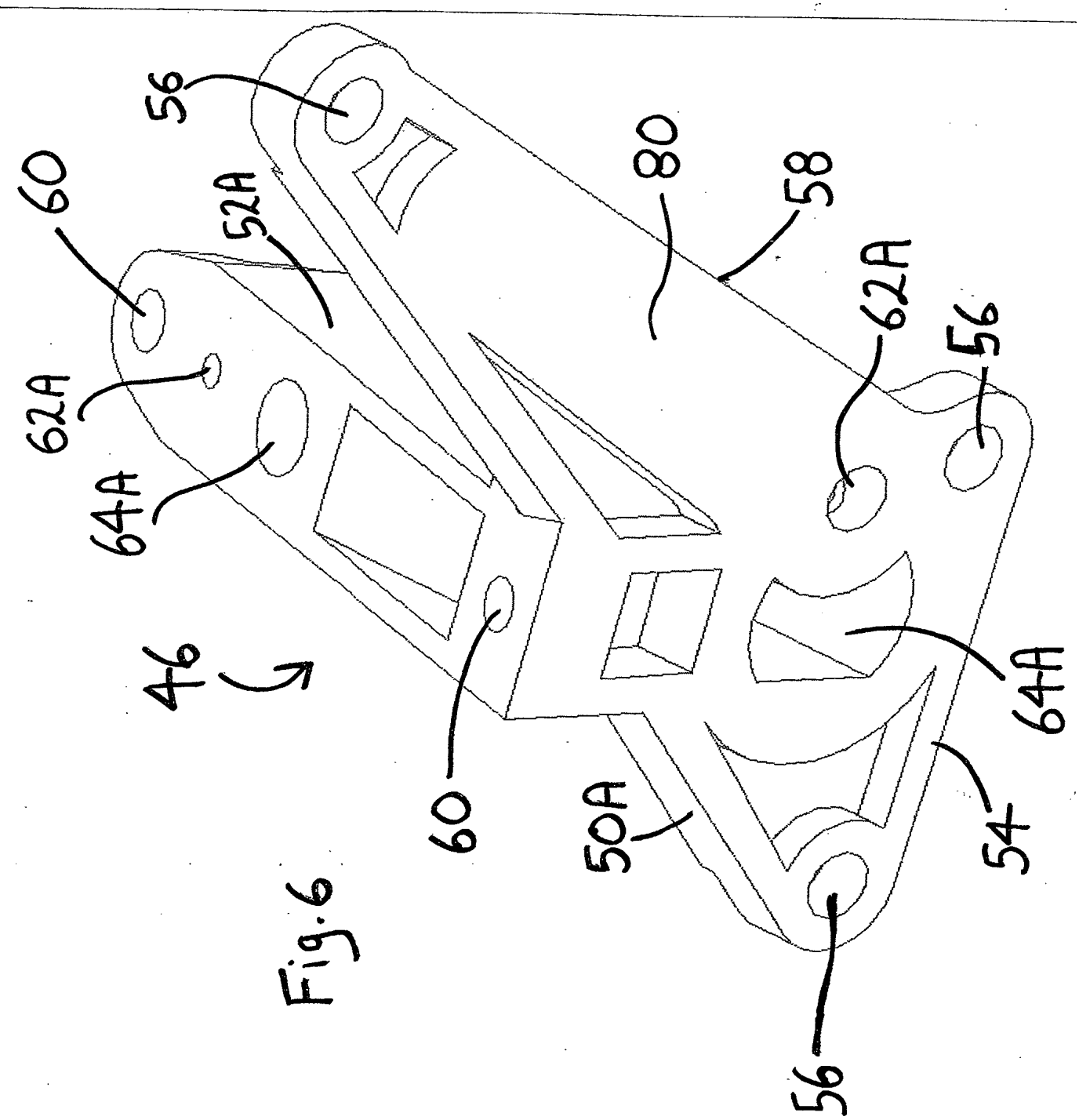


Fig. 6

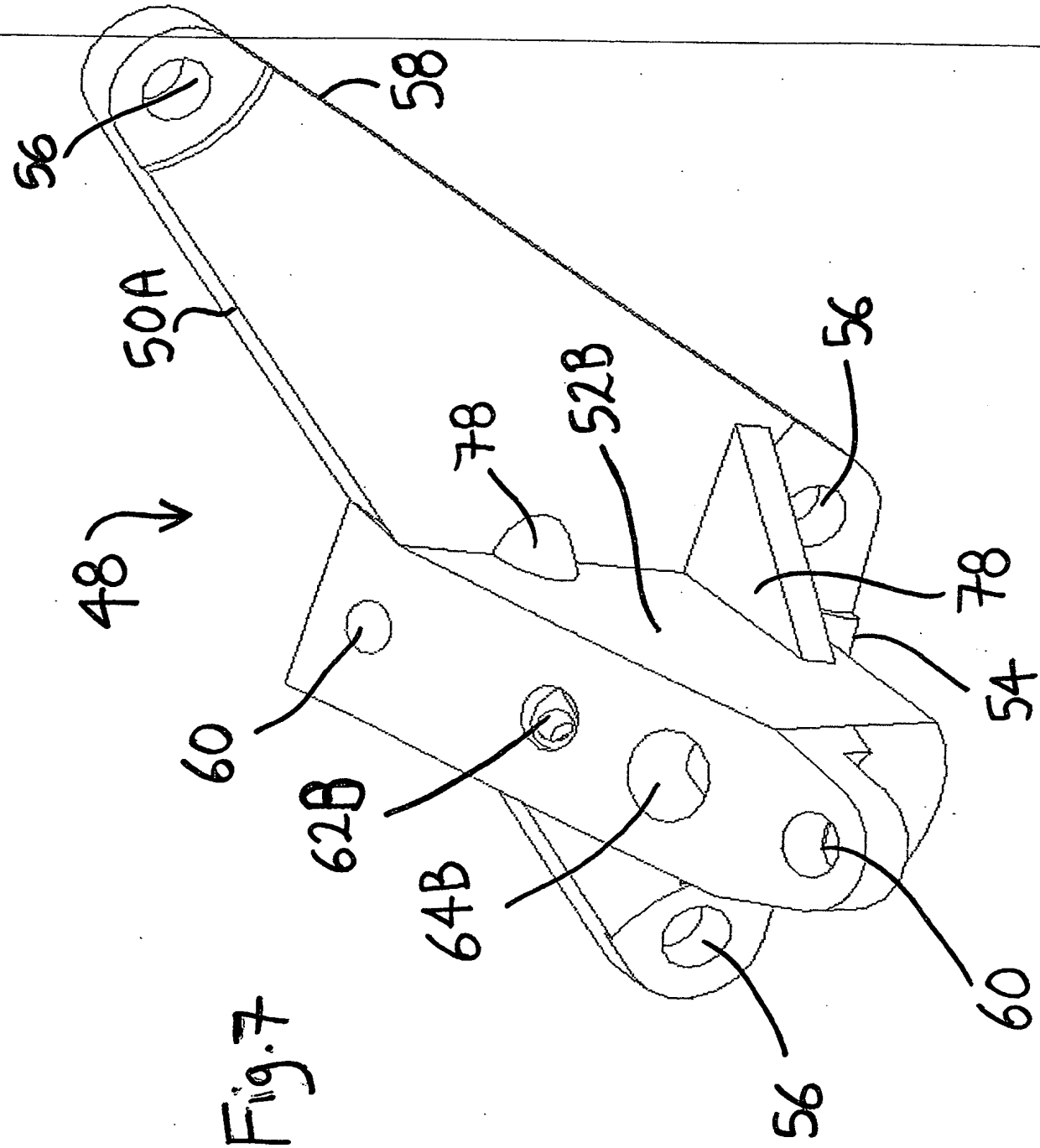


Fig. 7

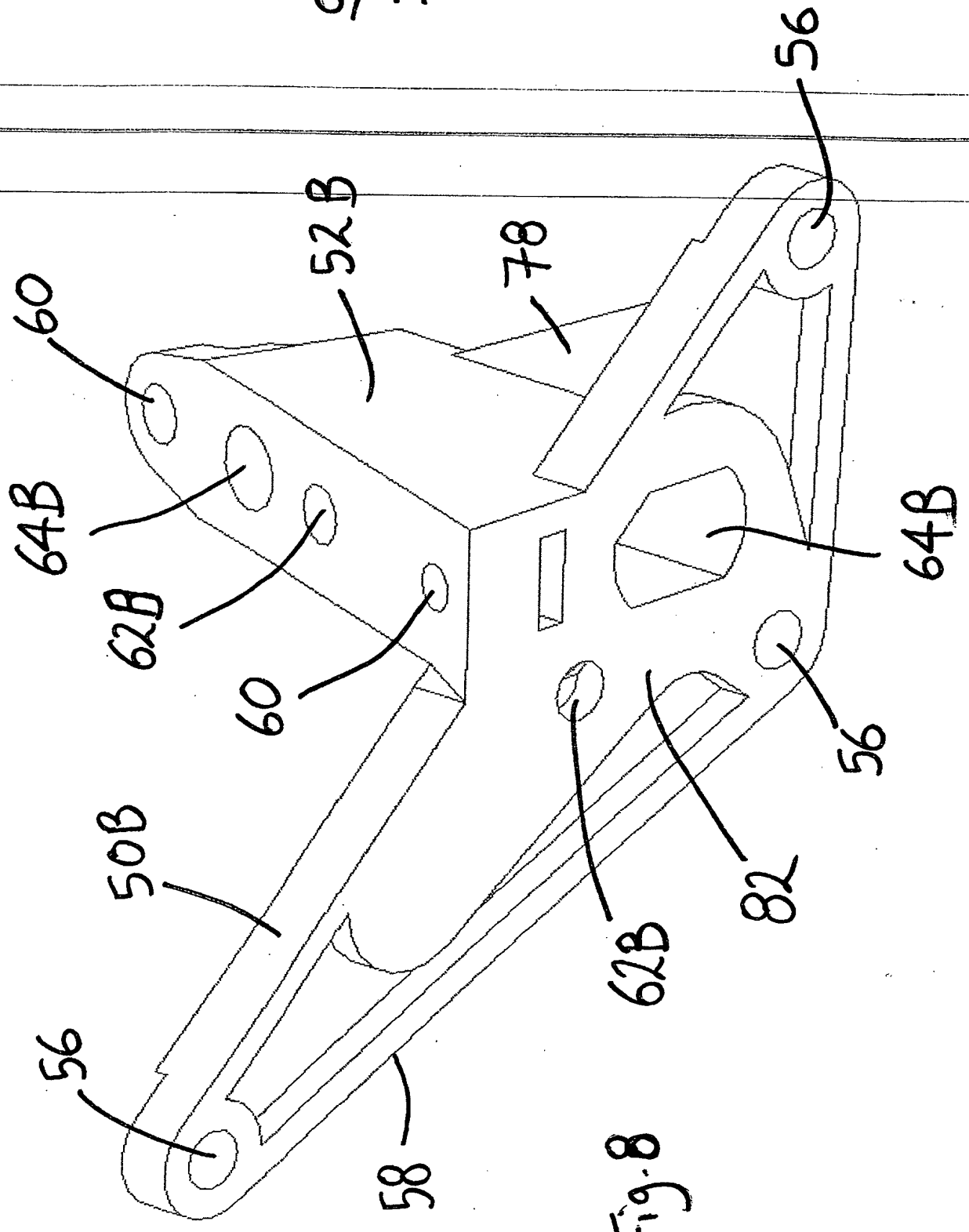
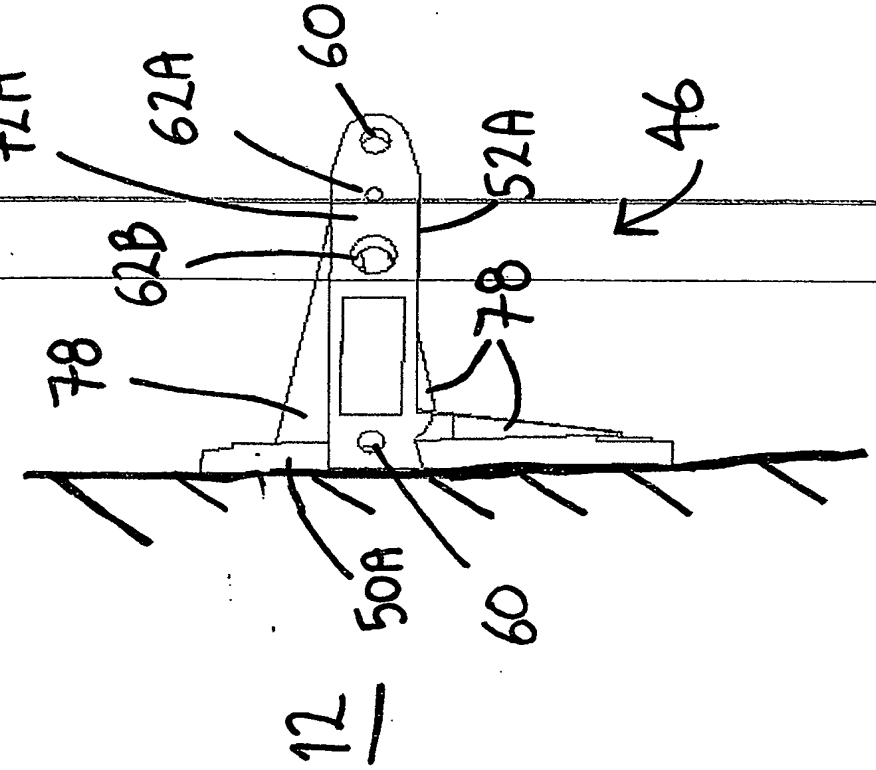


Fig. 8


72A
62A
60
52A
46
62B
78
78
50A
60

12

R ← → F

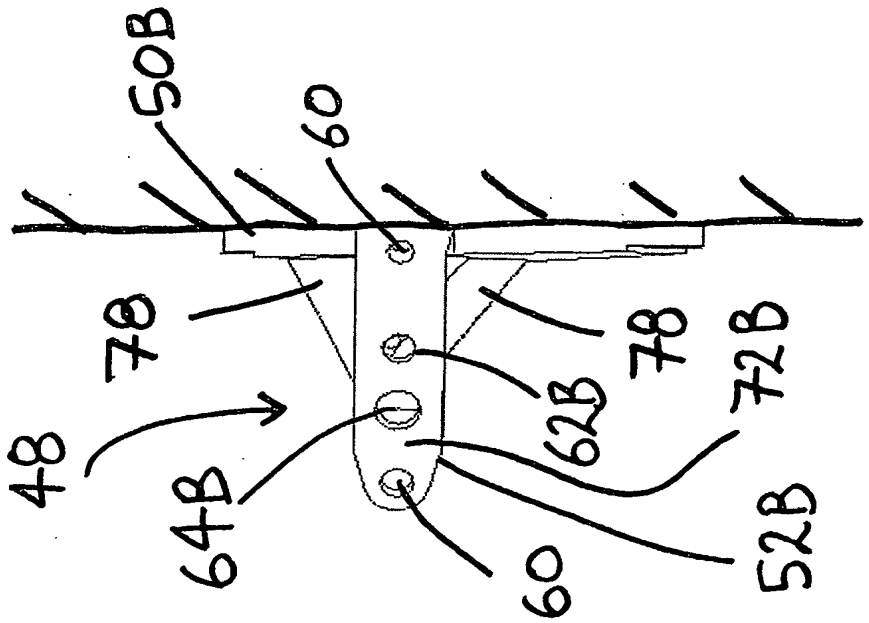
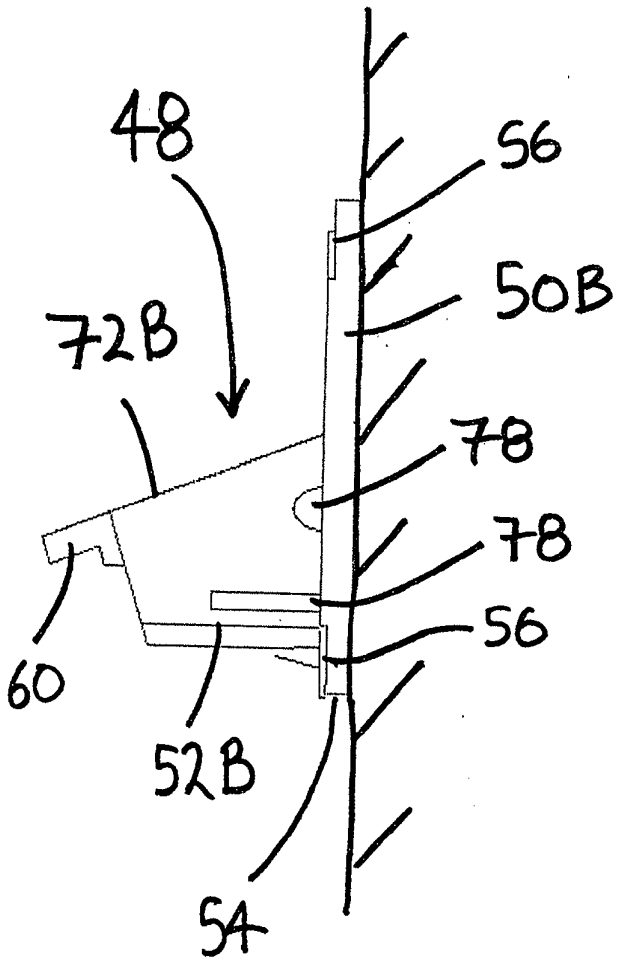

50B
60
78
78
72B
48
64B
62B
60
52B

Fig. 9



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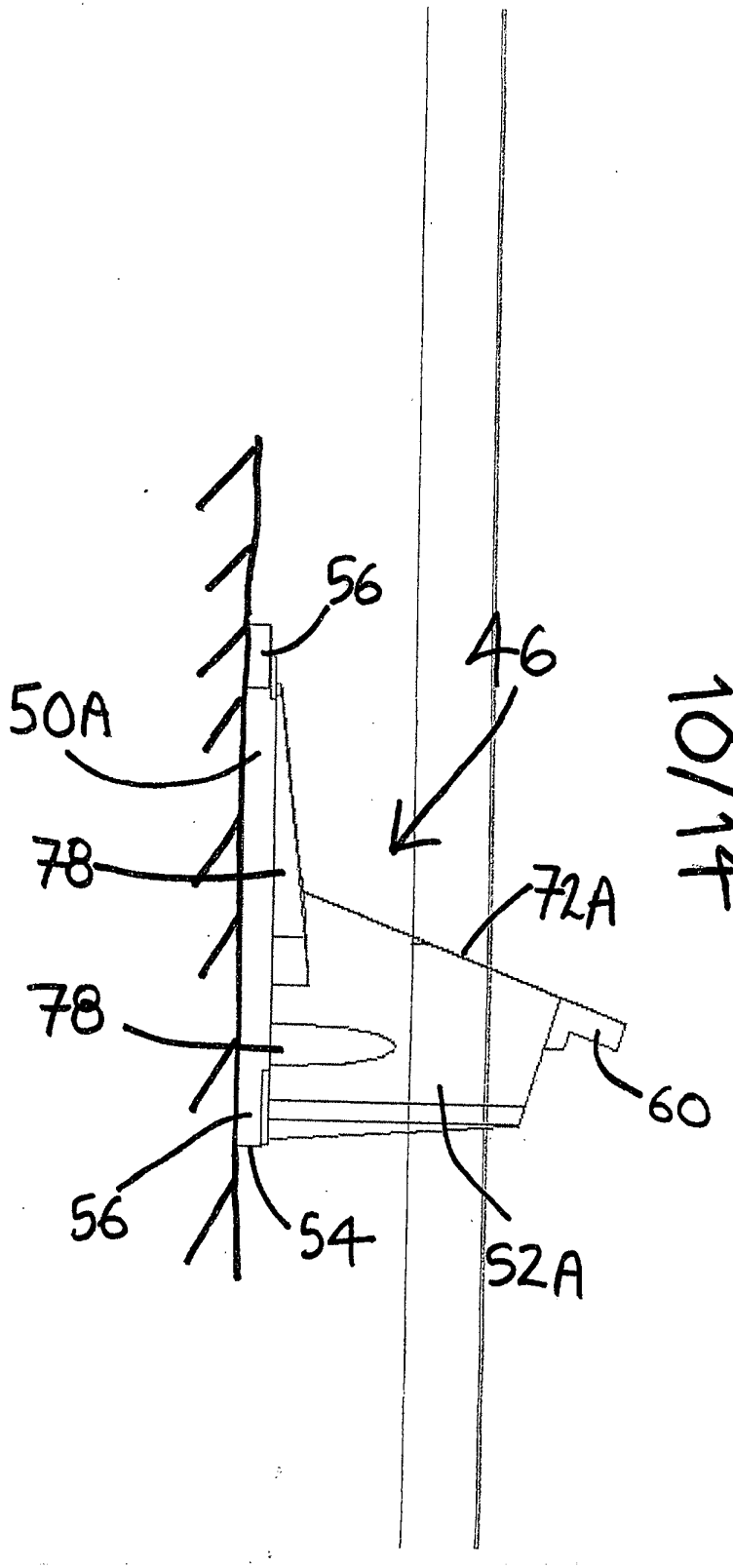

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Fig. 10

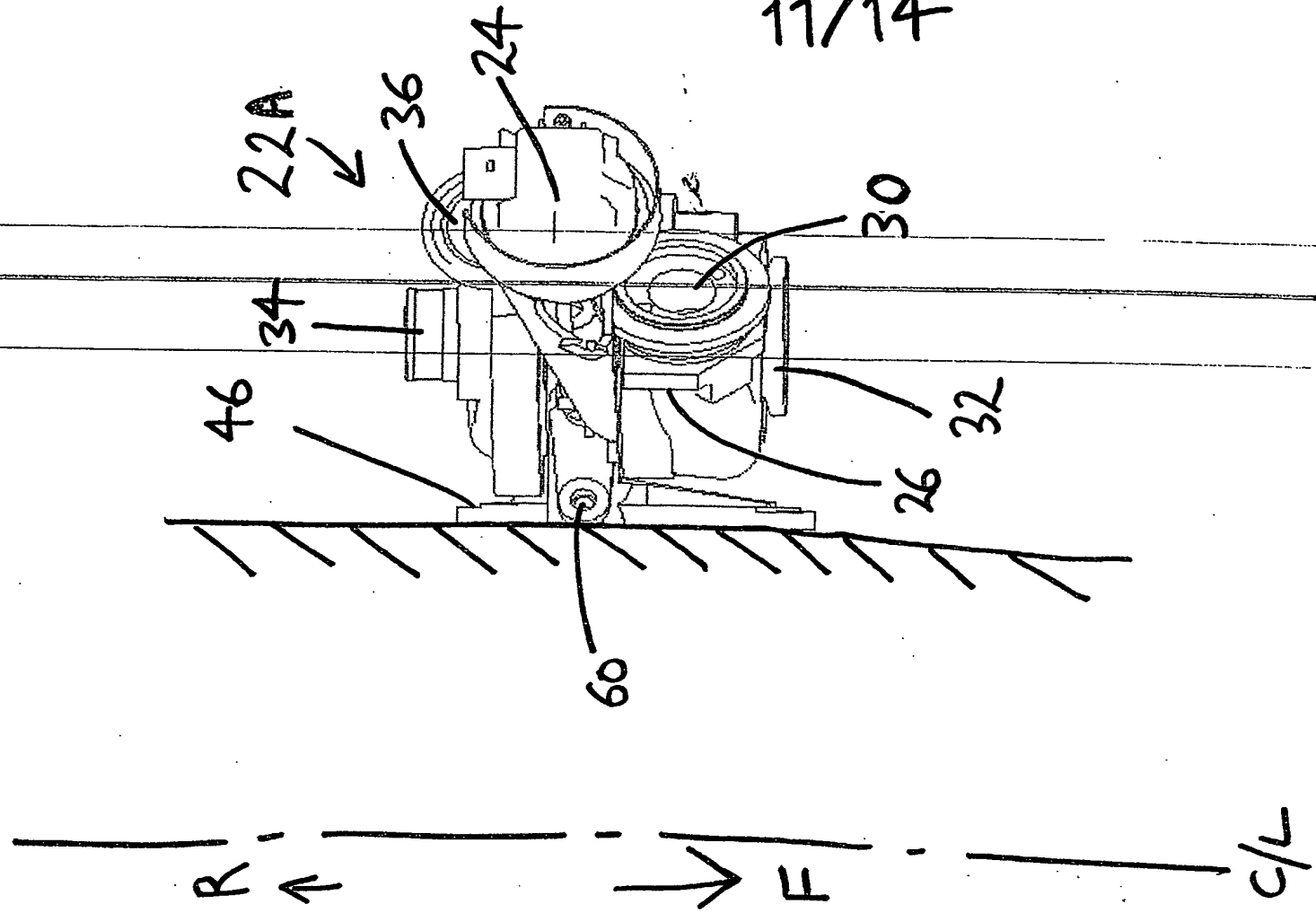
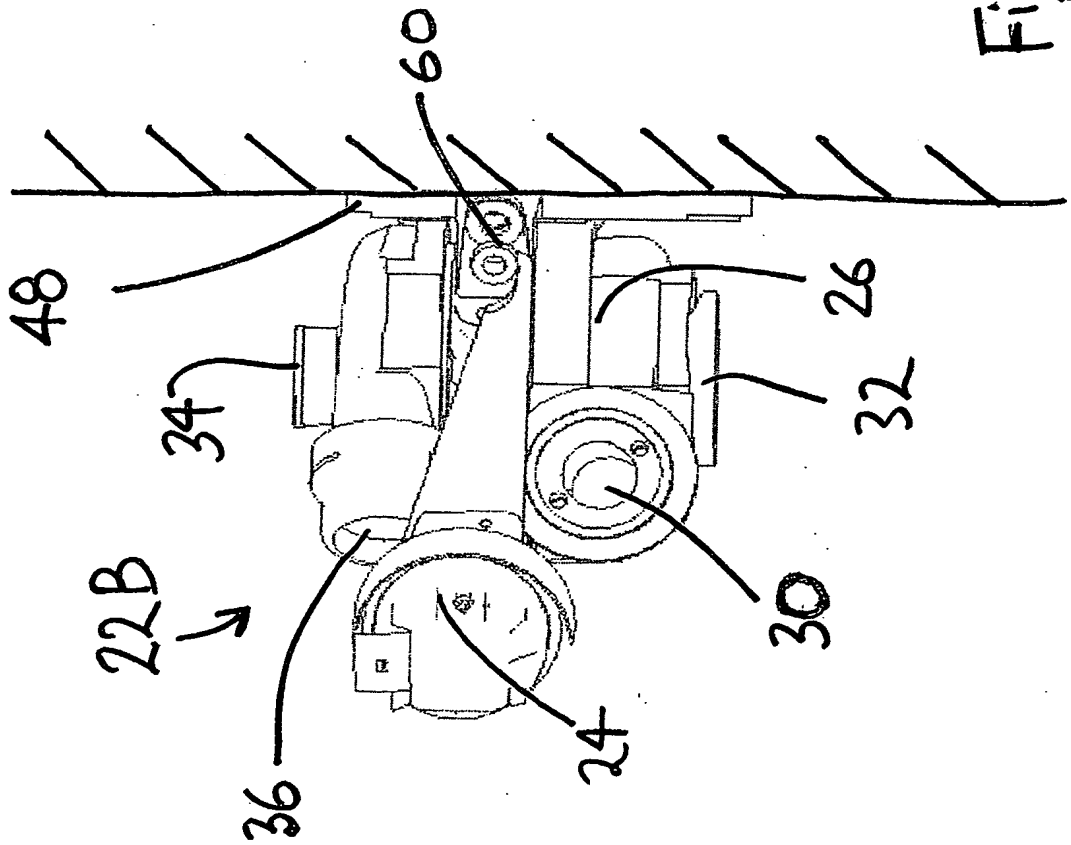


Fig. 17



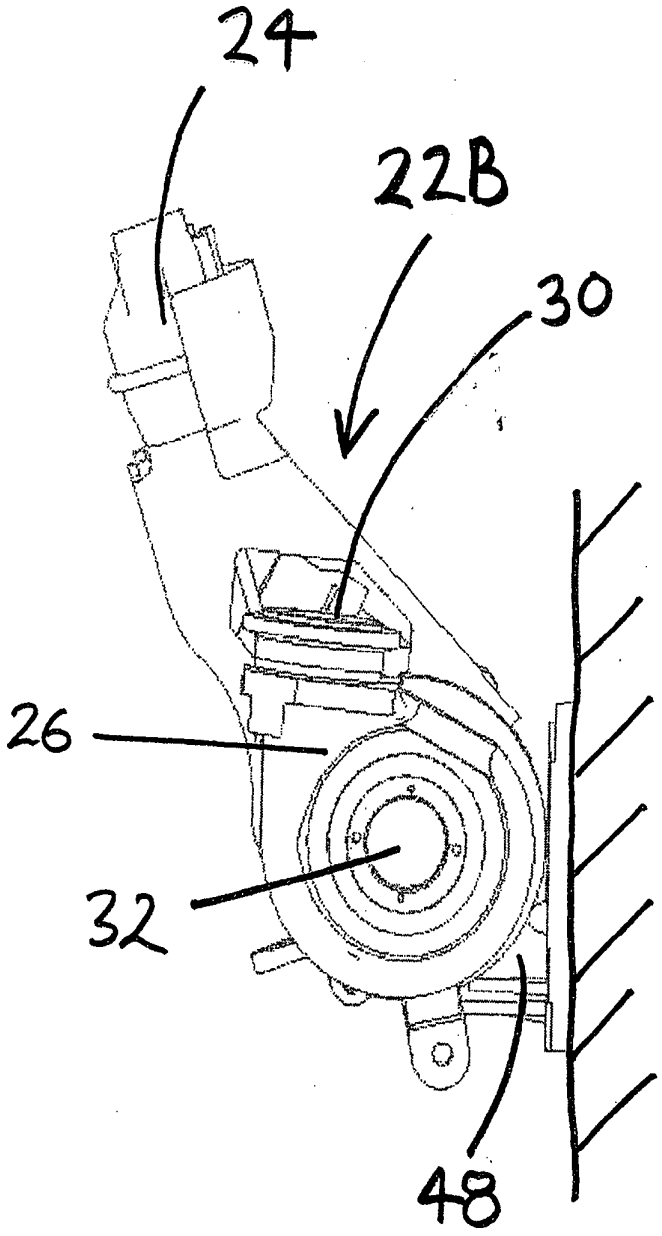


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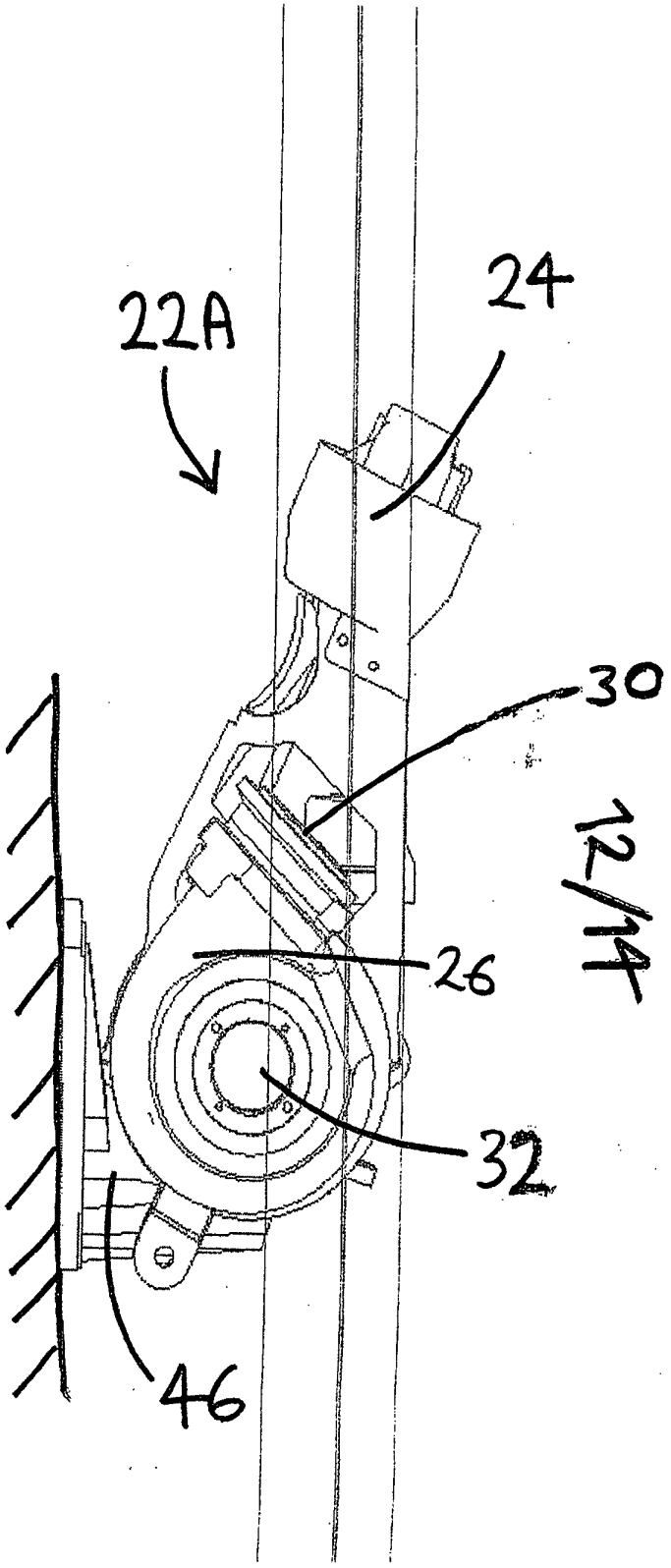
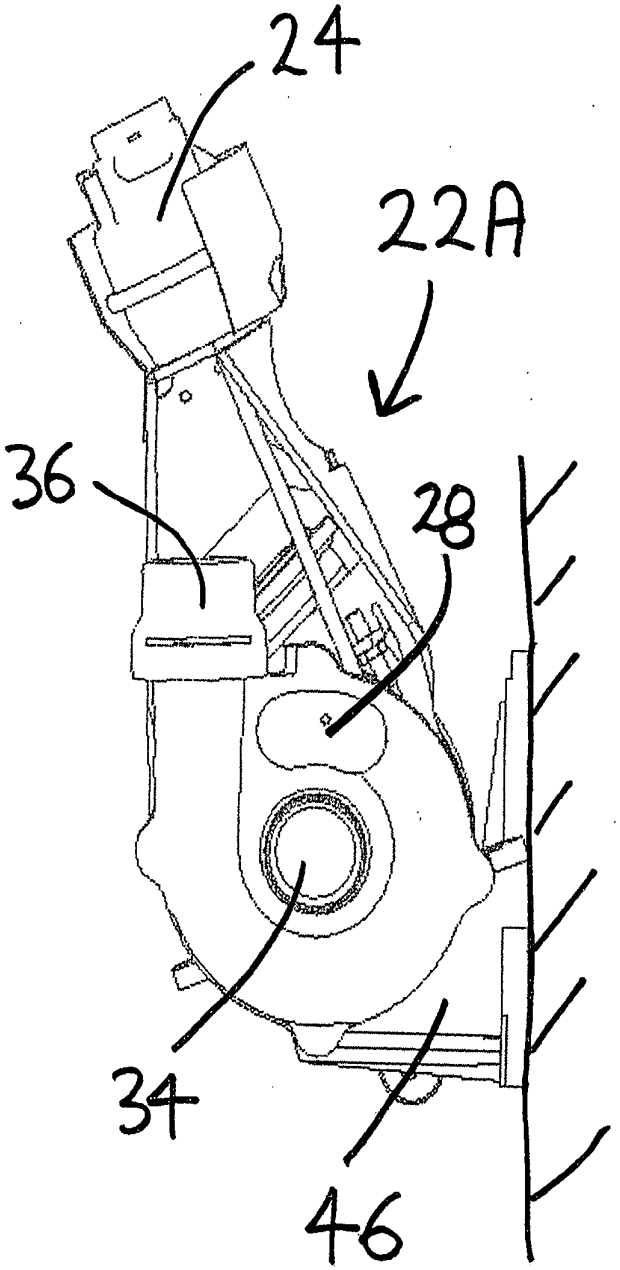
Fig. 12





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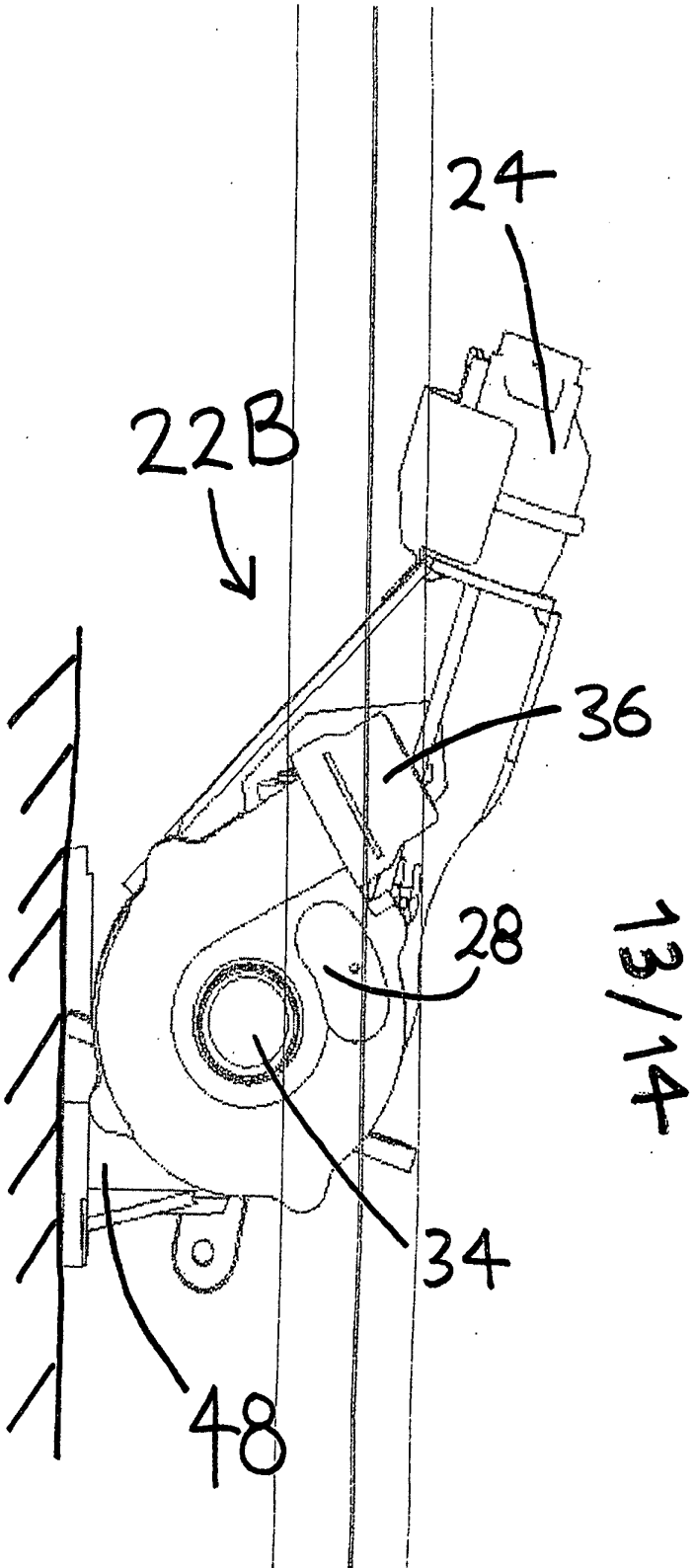

Fig. 13

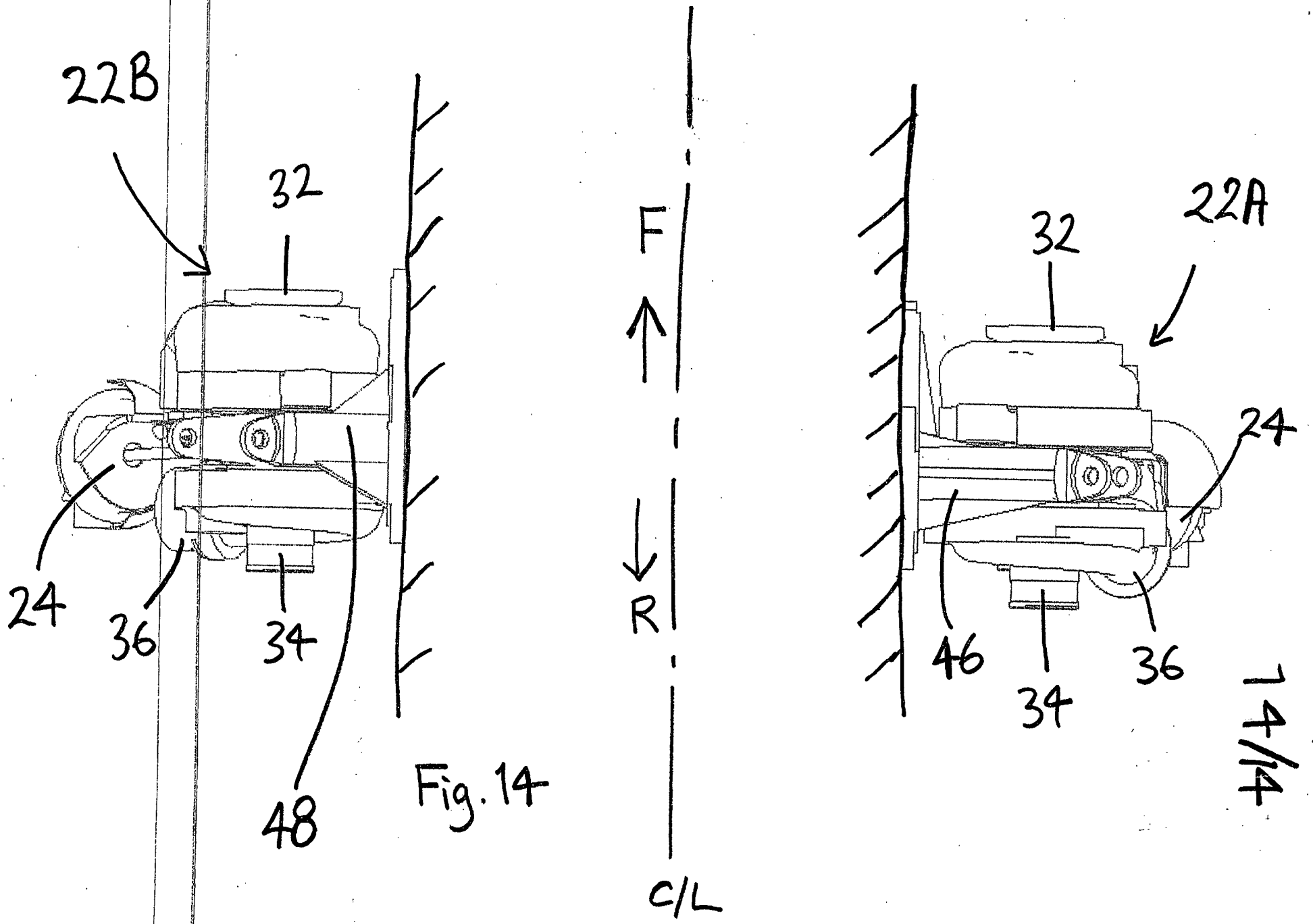

Fig. 14